

**DATA STRUCTURE & BASIC ALGORITHMS  
(CSEN 2001)**

**Time Allotted : 3 hrs**

**Full Marks : 70**

*Figures out of the right margin indicate full marks.*

*Candidates are required to answer Group A and  
any 5 (five) from Group B to E, taking at least one from each group.*

*Candidates are required to give answer in their own words as far as practicable.*

**Group - A  
(Multiple Choice Type Questions)**

1. Choose the correct alternative for the following: **10 × 1 = 10**
- (i) The memory requirement of an adjacency matrix is  
(a)  $O(n/2)$  (b)  $O(n^2)$  (c)  $O(n^3)$  (d)  $O(\log n)$
- (ii) The following sequence of operations is performed on stack. push(1), push(2), pop(), push(1), push(2), pop(), pop(), pop(), push(2), pop(). The sequence of popped out values are  
(a) 2,2,1,1,2 (b) 2,2,1,2,2 (c) 2,1,2,2,1 (d) 2,1,2,2,2.
- (iii) A heap tree can be used to implement  
(a) Tower of Hanoi (b) Priority Queue  
(c) Stack (d) None.
- (iv) In a Btree if the order of the tree is 4, then the max number of search key values  
(a) 4 (b) 3 (c) 2 (d)  $n/2$
- (v) In tower of Hanoi Problem, the number of disks movement required for 64 disks is  
(a)  $64^2 - 1$  (b)  $2^{64}$  (c)  $2^{64} - 1$  (d)  $64^2$ .
- (vi) The Inorder and Preorder traversal of a BST are (56, 60, 63, 70, 75, 80, 95) and (80, 70, 63, 56, 60, 75, 95) respectively. The leaf nodes of the tree are  
(a) 95, 75, 60 (b) 95, 63, 56  
(c) 60, 56, 95 (d) 95, 75, 56
- (vii) Recursive procedure makes use of the following data structure  
(a) Queue (b) Stack  
(c) Priority Queue (d) None.
- (viii) Given an infix expression  $(A-B/C)*(A*K-L)$ . The corresponding postfix expression is  
(a)  $ABC/-AK/L-*$  (b)  $ABC/-AK*L-*$   
(c)  $ABC/AK*L--$  (d)  $A-BC/*AK/L-$

- (ix) In a circular queue one of the condition when the queue is overflowed is  
(a) front = rear (b) front = rear+1  
(c) front = maxsize - rear (d) front = rear -1
- (x) The prefix expression of the infix expression  $a * (b + c) / e - f$   
(a) /\*a+bc-ef (b) -/\*a+bcef (c) -/\*+abcef (d) none.

**Group - B**

2. (a) What do you mean by ADT? [(Remember /LOCQ)]  
(b) Explain the functionalities of an ADT and why do you call it ADT. [(Analyze/IOCQ)]  
(c) Which asymptotic notation you will prefer to represent time complexity of an algorithm and justify your choice. [(Evaluate/HOCQ)]

**3 + 6 + 3 = 12**

3. (a) Write a function to create a linked list of n nodes. Next write another function to delete the first node from the list. [(Apply/IOCQ)]  
(b) "A complete binary tree can be efficiently represented using array". Justify for or against the statement. [(Evaluate/HOCQ)]  
(c) What is advantage of linked list over array? [(Understand/LOCQ)]

**6 + 3 + 3 = 12**

**Group - C**

4. (a) Write a C program to implement queue using stack. [(Create/HOCQ)]  
(b) Differentiate between stack and queue. [(Understand/LOCQ)]

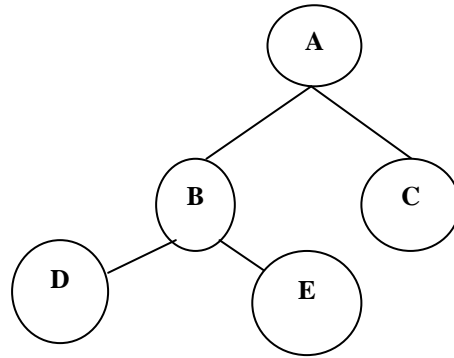
**8 + 4 = 12**

5. (a) What is tail recursion? Explain with example. [(Understand/LOCQ)]  
(b) When will you prefer recursion over iteration? Justify your answer. [(Evaluate/HOCQ)]  
(c) Draw the recursion tree for solving Tower of Hanoi problem to transfer 4 disks. [(Apply/IOCQ)]

**4 + 4 + 4 = 12**

**Group - D**

6. (a) The inorder and preorder traversals of a binary tree T yield the following sequence of nodes:  
Inorder : B C E D A F G  
Preorder : A B C D E F G  
Draw the tree T, explaining each step. [(Apply/IOCQ)]  
(b) Write the recursive algorithm for postorder and preorder traversal of a binary tree. [(Apply/IOCQ)]  
(c) Find the preorder, and postorder traversal of the given tree.



[[Understand/LOCQ]]

$3 + 5 + 4 = 12$

7. (a) Insert the following keys in the order given below to build them into an AVL tree 13, 222, 1, 43, 51, 36, 17, 10, 25, 24. Show each step. [[Understand/LOCQ]]  
 (b) What is the limitation of binary search tree? How can we overcome this limitation? [[Analyze/IOCQ]]  
 (c) Differentiate between DFS and BFS. [[Understand/LOCQ]]

$4 + 3 + 5 = 12$

**Group - E**

8. (a) How you can improvise Bubble Sort? Justify with code and analysis. [[Evaluate/HOCQ]]  
 (b) What is Collision? How it can be resolved? [[Remember/LOCQ]]
9. (a) Which sorting is known as online sorting and why? Justify. [[Evaluate/HOCQ]]  
 (b) Write an algorithm to implement Interpolation Search. [[Apply/IOCQ]]  
 (c) What is the difference between Binary Search and Interpolation Search? [[Understand/LOCQ]]

$3 + 5 + 4 = 12$

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	38%	33%	29%

\*LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question; HOCQ: Higher Order Cognitive Question

Department & Section	Submission Link
AEIE / IT	<a href="https://classroom.google.com/c/NDc0ODUyMzU3MzQ5/a/NDc0ODUzMTIxNzA0/details">https://classroom.google.com/c/NDc0ODUyMzU3MzQ5/a/NDc0ODUzMTIxNzA0/details</a>